What is claimed is:

1. Pumping light source for laser-active media comprising an outer member (36) enclosing a gas discharge medium, a first electrode (44) acting as a cathode and having a first electrode end (54) located within the outer member (36), a second electrode (64) acting as an anode and having a second electrode end (74) located within the outer member (36) and a gas discharge chamber located within the outer member (36) between the electrode ends (54, 74) facing one another, characterized in that the first electrode end (54) is essentially cooled by radiation and that a predominantly diffuse gas discharge (80) is formed proceeding from an areally extended surface area (84) located at the first electrode end (54).

2. Pumping light source as defined in claim 1, characterized in that the surface area (84) has essentially a uniformly high temperature.

3. Pumping light source as defined in claim 1 or 2, characterized in that the surface area overlaps a volume area (82) at the first electrode end (54), said volume area having essentially a uniformly high temperature.

4. Pumping light source as defined in any one of the preceding claims, characterized in that the surface area (84) is essentially free from steps.

5. Pumping light source as defined in claim 4, characterized in that the surface area (84) is defined by a section from a mathematical surface area extending in a continuous manner.

6. Pumping light source as defined in any one of the preceding claims, characterized in that the surface area (84) has an extension greater than two thirds of an average cross-sectional surface area of the volume area (82) at the first electrode end (54).

7. Pumping light source as defined in any one of the preceding claims, characterized in that the first electrode end (54) is coupled to the outer member (36) by way of heat conduction only via the electrode extending to an electrode opening (42) in the outer member (36).

8. Pumping light source as defined in any one of the preceding claims, characterized in that the extension of the first electrode (44) between an electrode opening (42) of the outer member (36) and the first electrode end (54) relative to the average cross section of the first electrode (44) is such that the extension is greater than ten times the average cross section of the first electrode (44).

9. Pumping light source as defined in claim 8, characterized in that in the first electrode (44) the heat resistance between the first electrode end (54) and the electrode opening (42) is at the most 10°C/W.

10. Pumping light source as defined in any one of the preceding claims, characterized in that the first electrode end (54) consists of a high melting metal.

11. Pumping light source as defined in any one of the preceding claims, characterized in that material forming the first electrode end (54) is provided with a dope additive leading during operation to a lower electrode operating temperature than in the case of the undoped material.

12. Pumping light source as defined in any one of the preceding claims, characterized in that the electrode operating temperature of the electrode end is lower than the melting temperature of the material of the electrode end.

13. Pumping light source as defined in any one of the preceding claims, characterized in that the first electrode end (54) consists of tungsten doped with a material with a work function for electrons smaller than that of pure tungsten.

14. Pumping light source as defined in claim 13, characterized in that the first electrode end (54) consists of tungsten doped with at least 0.1% by weight of lanthanum.

15. Pumping light source as defined in claim 14, characterized in that the first electrode end (54) consists of tungsten doped at the most with 5 % by weight of lanthanum.

16. Pumping light source as defined in any one of the preceding claims, characterized in that the first electrode (44) has a holding section (48) passing through the electrode

opening (42), said holding section consisting of a material wettable by the material of the outer member (36), and that an end section (52) supporting the first electrode end (54) adjoins this holding section (48).

17. Pumping light source as defined in claim 16, characterized in that the holding section (48) passing through the electrode opening (42) and the end section (52) are connected in a form-locking manner.

18. Pumping light source as defined in claim 17, characterized in that the connection of the holding section (48) and the end section (52) is brought about via a sleeve-like form-locking member (90).

19. Pumping light source as defined in any one of claims 16 to 18, characterized in that the holding section (48) of the first electrode (44) passing through the electrode opening (42) and the end section (52) are connected to one another by way of joining.

20. Pumping light source as defined in any one of the preceding claims, characterized in that the first electrode (44) extends essentially as a pin-like member between the electrode opening (42) and the first electrode end (52).

21. Pumping light source as defined in any one of the preceding claims, characterized in that the end section (52) of the first electrode (44) is designed as a pin-like member.

22. Pumping light source as defined in claim 20 or 21, characterized in that the first electrode end (54) has approximately the same cross section as the pin-like member.

23. Pumping light source as defined in claim 21 or 22, characterized in that the first electrode end (54) has a cross section increased in size in comparison with the pin-like member.

24. Pumping light source as defined in claim 23, characterized in that the end section (52) is thickened to form the first electrode end (54).

25. Pumping light source as defined in any one of the preceding claims, characterized in that a surface discontinuity (106) is provided at the first electrode end (54) for forming a gas discharge starting in a punctiform manner at this discontinuity.

26. Pumping light source as defined in claim 25, characterized in that the surface discontinuity (106) is located outside the surface area (84).

27. Pumping light source as defined in any one of the preceding claims, characterized in that this operates in the electric power range of approximately 0.1 kW to approximately 10 kW.

28. Process for the operation of a pumping light source as defined in any one of the preceding claims, characterized in that the gas discharge is started as an essentially punctiform

gas discharge and subsequently transfers into a predominantly diffuse gas discharge.

29. Pumping light source for laser-active media comprising:

an outer member enclosing a gas discharge medium, said outer member being optically transparent,

a first electrode acting as a cathode and having a first electrode end located within the outer member, the first electrode end being essentially cooled by thermal radiation,

a second electrode acting as an anode and having a second electrode end located within the outer member, and

said outer member having a gas discharge section extending between the electrode ends facing one another,

said pumping light source being operated with a gas discharge having a predominantly diffuse arc attachment at the first electrode proceeding from an areally extended surface area located at the first electrode end, said gas discharge generating pumping light exiting through said gas discharge section.

30. Pumping light source as defined in claim 29, wherein the surface area has essentially a uniformly high temperature.

31. Pumping light source as defined in claim 29, wherein the surface area overlaps a volume area at the first electrode end, said volume area having essentially a uniformly high temperature.

32. Pumping light source as defined in claim 29, wherein the surface area is essentially free from steps.

33. Pumping light source as defined in claim 32, wherein the surface area is defined by a section from a mathematical surface area extending in a continuous manner.

34. Pumping light source as defined in claim 29, wherein the surface area has an extension greater than two thirds of an average cross-sectional surface area of the volume area at the first electrode end.

35. Pumping light source as defined in claim 29, wherein the first electrode end is coupled to the outer member by way of heat conduction only via the electrode extending to an electrode opening in the outer member.

36. Pumping light source as defined in claim 29, wherein the extension of the first electrode between an electrode opening of the outer member and the first electrode end relative to the average cross section of the first electrode is such that the extension is greater than ten times the average cross section of the first electrode.

37. Pumping light source as defined in claim 36, wherein in the first electrode the heat resistance between the first electrode end and the electrode opening is at least 10°C/W.

38. Pumping light source as defined in claim 29, wherein the first electrode end consists of a high melting metal.

39. Pumping light source as defined in claim 29, wherein material forming the first electrode end is provided with a

dope additive leading during operation to a lower electrode operating temperature than in the case of the undoped material.

40. Pumping light source as defined in claim 29, wherein the electrode operating temperature of the electrode end is lower than the melting temperature of the material of the electrode end.

41. Pumping light source as defined in claim 29, wherein the first electrode end consists of tungsten doped with a material with a work function for electrons smaller than that of pure tungsten.

42. Pumping light source as defined in claim 41, wherein the first electrode end consists of tungsten doped with at least 0.1% by weight of lanthanum.

43. Pumping light source as defined in claim 42, wherein the first electrode end consists of tungsten doped at the most with 5 % by weight of lanthanum.

44. Pumping light source as defined in claim 29, wherein the first electrode has a holding section passing through the electrode opening, said holding section consisting of a material wettable by the material of the outer member, and that an end section supporting the first electrode end adjoins this holding section.

45. Pumping light source as defined in claim 44, wherein the holding section passing through the electrode opening and the end section are connected in a form-locking manner.

46. Pumping light source as defined in claim 45, wherein the connection of the holding section and the end section is brought about via a sleeve-like form-locking member.

47. Pumping light source as defined in claim 44, wherein the holding section of the first electrode passing through the electrode opening and the end section are connected to one another by way of joining.

48. Pumping light source as defined in claim 29, wherein the first electrode extends essentially as a pin-like member between the electrode opening and the first electrode end.

49. Pumping light source as defined in claim 29, wherein the end section of the first electrode is designed as a pin-like member.

50. Pumping light source as defined in claim 48, wherein the first electrode end has approximately the same cross section as the pin-like member.

51. Pumping light source as defined in claim 49, wherein the first electrode end has a cross section increased in size in comparison with the pin-like member.

52. Pumping light source as defined in claim 51, wherein the end section is thickened to form the first electrode end.

53. Pumping light source as defined in claim 29, wherein a surface discontinuity is provided at the first electrode end

for forming a gas discharge starting in a punctiform manner at this discontinuity.

54. Pumping light source as defined in claim 53, wherein the surface discontinuity is located outside the surface area.

55. Pumping light source as defined in claim 29, wherein this operates in the electric power range of approximately 0.1 kW to approximately 10 kW.

56. Process for the operation of a pumping light source as defined claim 29, wherein the gas discharge is started with an essentially punctiform arc attachment at the first electrode and subsequently transfers into a predominantly diffuse arc attachment.